

Claims:

What is claimed is:

1. A humidity control system for supplying either one of a dehumidified first air stream and a humidified second air stream to an indoor space and for discharging the other air stream to an outdoor space, the humidity control system comprising:

a refrigerant circuit (60) which includes first and second adsorbent-supported heat exchangers (61, 62) which are fluidly connected in the refrigerant circuit (60) to perform a refrigeration cycle, and which is capable of reversing the circulation direction of refrigerant;

a main unit (90) which includes: a main casing (11) having therein an air passageway in which the heat exchangers (61, 62) are disposed; and a switching mechanism for changing the distribution route of air in the main casing (11) depending on the circulation direction of refrigerant in the refrigerant circuit (60) so that the first air stream is passed through one of the heat exchangers (61, 62) that is functioning as an evaporator while the second air stream is passed through the other heat exchanger that is functioning as a condenser; and

a compressor unit (91) which is disposed outside the main casing (11) and in which a compressor (63) of the refrigerant circuit (60) is provided.

2. The humidity control system of claim 1, wherein the compressor unit (91) houses therein a reversal mechanism (64) for reversing the circulation direction of refrigerant in the refrigerant circuit (60).

3. The humidity control system of claim 2, wherein the compressor unit (91) houses therein an expansion mechanism (65) of the refrigerant circuit (60).

4. The humidity control system of claim 1, wherein the compressor unit (91) is installed outdoors.

5. The humidity control system of claim 1, wherein the compressor unit (91) is installed in an indoor machinery room.

6. The humidity control system of claim 1, wherein the compressor unit (91) is covered with a compressor casing (92) which is shaped like a hermetically-sealed container.

7. The humidity control system of claim 1, wherein:
the main casing (11) is shaped like a flattened box; and
an air supplying fan (25) and an air exhausting fan (26) for introduction of air into the main casing (11) are each formed by a respective multi-blade fan which is configured to draw in air from a lateral side of a fan casing thereof and then deliver it forward, and which is disposed such that the center of axle of its impeller is oriented in the thickness direction of the main casing (11).

8. The humidity control system of claim 1, wherein the first and second heat exchangers (61, 62) are arranged such that air flows in the thickness direction of the main casing (11).

9. The humidity control system of claim 1, wherein, in the main casing (11), an outlet opening (24) and an inlet opening (22) are opened to provide fluid connection with ducts (72, 74) in fluid communication with the indoor space and an outlet opening (23) and an inlet opening (21) are opened to provide fluid connection with ducts (71, 73) in fluid communication with the outdoor space.

10. The humidity control system of claim 9, wherein the humidity control system is installed in an under-roof space.

11. The humidity control system of claim 9, wherein the humidity control system is

installed on an indoor floor area.

12. The humidity control system of claim 1, wherein, in the main casing (11), an outlet opening (24) and an inlet opening (22) are opened to provide direct fluid communication between the main casing (11) and the indoor space and an outlet opening (23) and an inlet opening (21) are opened to provide fluid connection with ducts (71, 73) in fluid communication with the outdoor space.

13. The humidity control system of claim 1, wherein:

the humidity control system includes an air supplying fan (25) and an air exhausting fan (26) which are disposed in the main casing (11);

the main casing (11) is shaped like a box;

the main casing (11) has an internal space which is divided into a first space (17) defined along a fan side lateral plate (13) as a lateral plate of the main casing (11), and a remaining second space (18); and

the air supplying fan (25) and the air exhausting fan (26) are disposed in the first space (17) and the first and second heat exchangers (61, 62) and the switching mechanism are disposed in the second space (18).

14. The humidity control system of claim 13, wherein:

an air supplying opening (24) and an inside air inlet opening (22) which are in fluid communication with the indoor space are provided in one of lateral plates (14, 15) of the main casing (11) orthogonal to the fan side lateral plate (13), and an air exhausting opening (23) and an outside air inlet opening (21) which are in fluid communication with the outdoor space are provided in the other of the lateral plates (14, 15);

in the second space (18), a first heat exchange chamber (41) in which the first heat exchanger (61) is accommodated and a second heat exchange chamber (42) in which the second heat exchanger (62) is accommodated are defined adjacently side by side in a direction

orthogonal to the fan side lateral plate (13);

a first air inflow path (43) and a first air outflow path (44), and a second air inflow path (45) and a second air outflow path (46) are further provided in the second space (18), wherein the first air inflow path (43) and the first air outflow path (44) extend along one of a pair of lateral plates (32, 33) facing both the first heat exchange chamber (41) and the second heat exchange chamber (42) and are superimposedly arranged in the thickness direction of the main casing (11) and wherein the second air inflow path (45) and the second air outflow path (46) extend along the other of the pair of lateral plates (32, 33) and are superimposedly arranged in the thickness direction of the main casing (11); and

the outflow paths (44, 46) are in fluid communication with the first space (17) through fan side communication openings (75, 76).

15. The humidity control system of claim 13, wherein:

an air supplying opening (24) in fluid communication with the indoor space and an air exhausting opening (23) in fluid communication with the outdoor space are provided in the fan side lateral plate (13) of the main casing (11) and an inside air inlet opening (22) and an outside air inlet opening (21) are provided in a lateral plate (12) opposite the fan side lateral plate (13);

in the second space (18), a first heat exchange chamber (41) in which the first heat exchanger (61) is accommodated and a second heat exchange chamber (42) in which the second heat exchanger (62) is accommodated are defined adjacently side by side in the longitudinal direction of the fan side lateral plate (13);

a first air inflow path (43) and a second air inflow path (45), and a first air outflow path (44) and a second air outflow path (46) are further provided in the second space (18), wherein, between one of a pair of lateral plates (32, 33) facing both the first heat exchange chamber (41) and the second heat exchange chamber (42) and the lateral plate (12) opposite the fan side lateral plate (13), the first air inflow path (43) and the second air inflow path (45) extend along the lateral plate (12) and are superimposedly arranged in the thickness direction

of the main casing (11), and wherein, between the other of the pair of lateral plates (32, 33) and the fan side lateral plate (13), the first air outflow path (44) and the second air outflow path (46) extend along the fan side lateral plate (13) and are superimposedly arranged in the thickness direction of the main casing (11); and

the outflow paths (44, 46) are in fluid communication with the first space (17) through fan side communication openings (75, 76).

16. The humidity control system of claim 13, wherein the air supplying fan (25) and the air exhausting fan (26) are each formed by a respective multi-blade fan which is configured to draw in air from a lateral side of a fan casing thereof and then deliver it forward and which is disposed such that the center of axle of its impeller is oriented in the thickness direction of the main casing (11).

17. The humidity control system of claim 16, wherein the air supplying fan (25) is arranged such that an inlet opening (27), provided in the lateral side of the fan casing of the air supplying fan (25), faces either one of the fan side communication openings (75, 76); and

the air exhausting fan (26) is arranged such that an inlet opening (28), provided in the lateral side of the fan casing of the air exhausting fan (26), faces the other of the fan side communication openings (75, 76).

18. The humidity control system of claim 13, wherein a piping arrangement of the refrigerant circuit (60) for fluid connection with the first and second heat exchangers (61, 62) is provided along a top plate of the main casing (11).

19. The humidity control system of claim 1, wherein the humidity control system includes an outdoor filter (124) which is arranged and formed along both an outside air inflow surface of the first heat exchanger (61) and an outside air inflow surface of the second heat exchanger (62).

20. The humidity control system of claim 19, wherein:

a first passageway (41) in which the first heat exchanger (61) is disposed and a second passageway (42) in which the second heat exchanger (62) is disposed are formed in the main casing (11); and

the outdoor filter (124) comprises a first filter part (124a) disposed in the first passageway (41) and a second filter part (124b) disposed in the second passageway (42).

21. The humidity control system of claim 19, wherein:

in the outdoor filter (124), the first filter part (124a) and the second filter part (124b) are integral with each other; and

the outdoor filter (124) is arranged such that it extends over both the outside air inflow surface of the first heat exchanger (61) and the outside air inflow surface of the second heat exchanger (62).

22. The humidity control system of claim 21, wherein, in the main casing (11), the first heat exchanger (61) and the second heat exchanger (62) are disposed adjacently to each other and the inflow surface of the first heat exchanger (61) and the inflow surface of the second heat exchanger (62) lie on approximately the same plane.

23. The humidity control system of claim 19, wherein the main casing (11) is provided with a take-out opening (161) from which the outdoor filter (124) can be taken out.

24. The humidity control system of claim 20, wherein the humidity control system is operable to switch its operation between a first operation in which outside air is distributed first through the first filter part (124a) and then through the first heat exchanger (61) and is thereafter supplied to the indoor space while simultaneously room air is distributed first through the second heat exchanger (62) and then through the second filter part (124b) and is

thereafter expelled to the outside space, and a second operation in which outside air is distributed first through the second filter part (124b) and then through the second heat exchanger (62) and is thereafter supplied to the indoor space while simultaneously room air is distributed first through the first heat exchanger (61) and then through the first filter part (124a) and is thereafter expelled to the outdoor space.

25. The humidity control system of claim 20, wherein:

the humidity control system includes an indoor filter (123b) which is disposed in a passageway through which room air is made to flow into either of the first or the second passageways (41, 42); and

the humidity control system is operable to switch its operation between a first operation in which outside air is distributed first through the first filter part (124a) and then through the first heat exchanger (61) and is thereafter supplied to the indoor space while simultaneously room air is distributed first through the indoor filter (123b), then through the second heat exchanger (62), and then through the second filter part (124b) and is thereafter expelled to the outside space, and a second operation in which outside air is distributed first through the second filter part (124b) and then through the second heat exchanger (62) and is thereafter supplied to the indoor space while simultaneously room air is distributed first through the indoor filter (123b), then through the first heat exchanger (61), and then through the first filter part (124a) and is thereafter expelled to the outdoor space.

26. The humidity control system of either claim 1 or claim 19, wherein:

a first passageway (41) in which the first heat exchanger (61) is disposed, a second passageway (42) in which the second heat exchanger (62) is disposed, and a room air supplying passageway through which room air is made to flow into either of the first or the second passageways (41, 42) are formed in the main casing (11); and

the humidity control system includes an indoor filter (123b) which is disposed in the room air supplying passageway.

27. The humidity control system of either claim 1 or claim 19, wherein:

a first passageway (41) in which the first heat exchanger (61) is disposed and a second passageway (42) in which the second heat exchanger (62) is disposed are formed in the main casing (11); and

the humidity control system includes:

a suction opening (163) which faces the indoor space by being in fluid connection with an air passageway which is located nearer to the indoor space than the first and second passageways (41, 42) in the main casing (11); and

an indoor filter (123b) which is disposed in the vicinity of an opening part of the suction opening (163).

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